COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 00-2

NSF 00-78 **07/19/00**

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)

DGE - IGERT PREPROPOSALS

FOR NSF USE ONLY

NSF PROPOSAL NUMBER

0092130

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION
				075746271	

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SHOW PREVIOUS AWARD NO. IF THIS IS
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NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE

University of Idaho

AWARDEE ORGANIZATION CODE (IF KNOWN)

0016261000

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE

University of Idaho
Moscow, ID. 838443010

NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE

PERFORMING ORGANIZATION CODE (IF KNOWN)

ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE

IS AWARDEE ORGANIZATION (Check All That Apply)
(See GPG II.D.1 For Definitions) ☐ FOR-PROFIT ORGANIZATION ☐ SMALL BUSINESS ☐ MINORITY BUSINESS ☐ WOMAN-OWNED BUSINESS

TITLE OF PROPOSED PROJECT **Collaborative Research into the Behavior of Fractured Geological Systems and Providing Technical Information to Support Environmental Decisions**

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PREPROPOSAL NO., IF APPLICABLE
$ **2,097,203**	**60** months	**10/01/01**	

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

☐ BEGINNING INVESTIGATOR (GPG 1.A.3)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.D.1)
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG II.D.10)
☐ NATIONAL ENVIRONMENTAL POLICY ACT (GPG II.D.10)
☐ HISTORIC PLACES (GPG II.D.10)
☐ SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.D.12)
☐ VERTEBRATE ANIMALS (GPG II.D.12) IACUC App. Date _____
☐ HUMAN SUBJECTS (GPG II.D.12)
Exemption Subsection _____ or IRB App. Date _____
☐ INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES _____
☐ FACILITATION FOR SCIENTISTS/ENGINEERS WITH DISABILITIES (GPG V.G.)
☐ RESEARCH OPPORTUNITY AWARD (GPG V.H)

PI/PD DEPARTMENT
Geology and Geological Engineering

PI/PD FAX NUMBER
208-885-6431

PI/PD POSTAL ADDRESS
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Moscow, ID 838443011
United States

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME **Leland L Mink**	**Ph.D.**	**1973**	**208-885-6429**	**iwrri@uidaho.edu**
CO-PI/PD **Harold Blackman**	**Ph.D.**	**1980**	**208-526-0245**	**hsb@inel.gov**
CO-PI/PD **Jerry Harbour**	**Ph.D**	**1988**	**208-526-4301**	**harbgl@inel.gov**
CO-PI/PD **Robert R Stiger**	**Ph.D**	**1998**	**208-282-7937**	**bobs@if.uidaho.edu**
CO-PI/PD				

CERTIFICATION PAGE

Certification for Principal Investigators and Co-Principal Investigators:

I certify to the best of my knowledge that:

(1) the statements herein (excluding scientific hypotheses and scientific opinions) are true and complete, and
(2) the text and graphics herein as well as any accompanying publications or other documents, unless otherwise indicated, are the original work of the signatories or individuals working under their supervision. I agree to accept responsibility for the scientific conduct of the project and to provide the required progress reports if an award is made as a result of this proposal.

I understand that the willful provision of false information or concealing a material fact in this proposal or any other communication submitted to NSF is a criminal offense (U.S.Code, Title 18, Section 1001).

Name (Typed)	Signature	Social Security No.*	Date
PI/PD **Leland L Mink**			
Co-PI/PD **Harold Blackman**			
Co-PI/PD **Jerry Harbour**			
Co-PI/PD **Robert R Stiger**			
Co-PI/PD			

SSN's are confidential and are not displayed *ON FASTLANE SUBMISSIONS*

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the individual applicant or the authorized official of the applicant institution is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding Federal debt status, debarment and suspension, drug-free workplace, and lobbying activities (see below), as set forth in Grant Proposal Guide (GPG), NSF 00-2. Willful provision of false information in this application and its supporting documents or in reports required under an ensuring award is a criminal offense (U. S. Code, Title 18, Section 1001).

In addition, if the applicant institution employs more than fifty persons, the authorized official of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of Grant Policy Manual Section 510; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflict which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Debt and Debarment Certifications

(If answer "yes" to either, please provide explanation.)

Is the organization delinquent on any Federal debt?	Yes ☐	No ☒
Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?	Yes ☐	No ☒

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding $100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, ''Disclosure Form to Report Lobbying,'' in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME/TITLE (TYPED) **Ted Mordhorst, Mgr G/C & Compliance Off**		**07/18/00**

TELEPHONE NUMBER	ELECTRONIC MAIL ADDRESS	FAX NUMBER
208-885-2560	**tedm@uidaho.edu**	**208-885-5752**

*SUBMISSION OF SOCIAL SECURITY NUMBERS IS VOLUNTARY AND WILL NOT AFFECT THE ORGANIZATION'S ELIGIBILITY FOR AN AWARD. HOWEVER, THEY ARE AN INTEGRAL PART OF THE INFORMATION SYSTEM AND ASSIST IN PROCESSING THE PROPOSAL. SSN SOLICITED UNDER NSF ACT OF 1950, AS AMENDED.

PROPOSAL NO.: 0092130
PRINCIPAL INVESTIGATOR: Mink, Leland
INSTITUTION NAME: University of Idaho
TITLE: Collaborative Research into the Behavior of Fractured Geological Systems and Providing Technical Information to Support Environmental Decisions
NSF RECEIVED DATE: 07/18/2000

(A) Project Summary

COLLABORATIVE RESEARCH INTO THE BEHAVIOR OF FRACTURED GEOLOGICAL SYSTEMS AND PROVIDING TECHNICAL INFORMATION TO SUPPORT ENVIRONMENTAL DECISIONS

Directed by: Leland L. Mink
Lead Institution: University of Idaho

This Integrative Graduate Education and Research Training (IGERT) program will provide a portion of the support required for a multidisciplinary, multi-institutional program involving five northwest universities and one national laboratory. The program will produce 25 research scientists with a sound educational and research background in subsurface systems–people who can inject scientific information into the social systems that make decisions about subsurface systems.

The proposed program in subsurface systems management focuses on interdisciplinary course work and research addressing better management of subsurface contaminants and the nation's various subsurface natural resources (including geothermal, oil, gas, and water). Improving the management of subsurface systems requires improving our understanding of the physical, chemical, and biological processes occurring within the earth's surface, and improving subsequent associated decision processes and actions. The combination of *engineering-fluid dynamics, geology/hydrogeology, and psychology decision analysis* is a unique and innovative approach to both the technical problem and solution implementation.

This program will improve our ability to predict and monitor the movement and transformation of subsurface contaminants by developing better geological and flow models of fractured geological formations. These models will help reduce uncertainty and will improve the technical basis for clean-up solutions and long-term environmental stewardship strategies. It is becoming increasingly clear that learning how to apply an understanding of subsurface phenomena through an effective decision process that includes the considerations of all stakeholders is critical to sound environmental management. As such, subsurface systems management must, as this program will, involve a variety of disciplines, including microbiology, geology, hydrology, chemistry, engineering, fluid dynamics, and the social, behavioral, and decision sciences.

Students selected for this program will be supported using new and existing courses, co-mentored by faculty from five universities, and centered at the new 50,000 ft^2, University of Idaho Center for Science and Technology Laboratory located in Idaho Falls.

PROPOSAL NO	INSTITUTION	PLEASE RETURN BY
0092130	University of Idaho	09/24/03

PRINCIPAL INVESTIGATOR	NSF PROGRAM
Mink, Leland L.	IGERT PREPROPOSALS

PROPOSAL TITLE
Collaborative Research into the Behavior of Fractured Geological Systems and Providing Technical Information to Support Environmental Decisions

	REVIEWER	NSF I.D GENDER DISCIPLINE PIN	DATE SENT RETURNED	REVIEWER (R) PANELIST (P) BOTH (B)	REVIEWED (R) NOT REVIEWED (N) COI (C) LATE (L)	REVIEWER RATING
1	Dr. Peter Alpert, Department of Biology University of Massachusetts, Amherst Amherst, MA 01003-5810 palpert@bio.umass.edu	EZ0321975 Male Life Science Biological ******	09/25/00	P	P	
2	Dr. Subir K. Banerjee, Department Geology and Geophysics University of Minnesota 310 Pillsbury Drive SE Minneapolis, MN 55455- banerjee@umn.edu	000011659 Male Geological Sciences ******	09/25/00 09/21/00	P	R	Good
3	Dr. Joan F. Braddock, Institute of Arctic Biology University of Alaska Fairbanks 311 Irving I Bldg. Fairbanks, AK 99775-7000 ffjfb@uaf.edu	YY0721567 Female Ecology ******	09/25/00	P	P	
4	Dr. Lee W. Cooper, Ecology and Evolutionary Biology University of Tennessee 569 Dabney Hall Knoxville, TN 37996- lcooper1@utk.edu	AX0607339 Male Geological Sciences ******	09/25/00	P	P	
5	Dr. Sherry O. Farwell, Graduate Education and Research Office South Dakota School of Mines and Tech. 501 East St. Joseph Rapid City, SD 57701-3995 sherry.farwell@sdsmt.edu	HU0523082 Male Chemistry ******	09/25/00 09/23/00	P	R	Fair
6	Dr. Maria J. Gonzalez, Department of Zoology Miami University Oxford, OH 45056- gonzalmj@muohio.edu	TB0762692 Female Environmental Biology ******	09/25/00	P	P	

PROPOSAL NO	INSTITUTION	PLEASE RETURN BY
0092130	University of Idaho	09/24/03

PRINCIPAL INVESTIGATOR	NSF PROGRAM
Mink, Leland L.	IGERT PREPROPOSALS

PROPOSAL TITLE
Collaborative Research into the Behavior of Fractured Geological Systems and Providing Technical Information to Support Environmental Decisions

	REVIEWER	NSF I.D GENDER DISCIPLINE PIN	DATE SENT RETURNED	REVIEWER (R) PANELIST (P) BOTH (B)	REVIEWED (R) NOT REVIEWED (N) COI (C) LATE (L)	REVIEWER RATING
7	Dr. Richard A. Hansis, Environmental Science Humboldt State University Natural Resources Arcata, CA 95521- rah14@humboldt.edu	GS0571005 Male Geography ******	09/25/00	P	P	
8	Dr. Everette Joseph, Physics and Astronomy Howard University 2355 Sixth Street, NW Washington, DC 20059-0001 ejoseph@howard.edu	QT0788729 Male Physics ******	09/25/00	P	P	
9	Dr. Gerald Matisoff, Department of Geological Science Case Western Reserve University AW Smith 110-112 Cleveland, OH 44106-7216 gxm4@po.cwru.edu	VN0317642 Male Geological Sciences ******	09/25/00 09/20/00	P	R	Fair
10	Dr. Mark Meo, Science and Public Policy Program University of Oklahoma 100 E. Boyd Street, Rm. S-202 Norman, OK 73019- mmeo@ou.edu	BN0606163 Male Law ******	09/25/00	P	P	
11	Dr. Heidi M. Nepf, Civil and Environmental Engineering Massachusetts Institute of Technology Parsons Laboratory, 48-423 Cambridge, MA 02139-4307 hmnepf@MIT.EDU	MW0708990 Female Physical & Chemical Oceanography ******	09/25/00	P	P	
12	Dr. Craig W. Osenberg, Department of Zoology University of Florida 223 Bartram Hall Gainesville, FL 32611-8525 osenberg@zoo.ufl.edu	ZZ0704744 Male Ecology ******	09/25/00	P	P	

PROPOSAL NO	INSTITUTION	PLEASE RETURN BY
0092130	University of Idaho	09/24/03

PRINCIPAL INVESTIGATOR	NSF PROGRAM
Mink, Leland L.	IGERT PREPROPOSALS

PROPOSAL TITLE
Collaborative Research into the Behavior of Fractured Geological Systems and Providing Technical Information to Support Environmental Decisions

	REVIEWER	NSF I.D GENDER DISCIPLINE PIN	DATE SENT RETURNED	REVIEWER (R) PANELIST (P) BOTH (B)	REVIEWED (R) NOT REVIEWED (N) COI (C) LATE (L)	REVIEWER RATING
13	Dr. James N. Petersen, College for Engineering and Architecture Washington State University 145 Dana Hall Spokane Street Pullman, WA 99164-2719 jnp@wsu.edu	KY0788552 Male Engineering-Chemical ******	09/25/00	P	P	
14	Dr. Robert A. Reves-Sohn, Marine Geology and Geophysics Woods Hole Oceanographic Institution Clark South, Rm 283, MS 24 Woods Hole, MA 02543- rsohn@whoi.edu	HG0779997 Male Geological Sciences ******	09/25/00 09/19/00	P	R	Good
15	Dr. Lynn M. Walter, Department of Geological Sciences University of Michigan 425 East University St. Ann Arbor, MI 48109-1063 lmwalter@umich.edu	AD0516805 Female Geological Sciences ******	09/25/00	P	P	
16	Dr. Amelia K. Ward, Department of Biological Sciences University of Alabama, Tuscaloosa Box 870206 Tuscaloosa, AL 35487- award@biology.as.ua.edu	PD0316707 Female Ecology ******	09/25/00	P	P	

Title: Collaborative Research into the Behavior of Fractured Geological Systems and Providing Technical Information to Support Environmental Decisions

Institution: University of Idaho

NSF Program: Integrative Graduate Education and Research Training Program, IGERT-Preproposal

Principal Investigator: Mink, Leland L.

Received Date:09/21/00
Rating: Good

Review:

This is an ambitiously designed and handsomely crafted proposal for integrative education in an area of great intellectual and equally great social-environmental challenge. The three focus areas chosen for integration, engineering fluid dynamics, geology/hydrology and psychology/decision analysis are excellent for the success of the grand design. As a broad-gauge earth scientist, I applaud the main focus on knowledge creation in the area of flow through fractured rock. It is both intellectually stimulating and appropriately challenging a science/technology for environmental application into hazard assessment and hazard mitigation. The plans for bench scale experiments in hydrology to test and improve the numerical models from fluid dynamics are, I believe, do-able and important. The language on psychology/decision analysis (page C-4) is both imaginative and persuasive).

However, I find myself hesitant to support the proposal as it stands. The problems as I see it, are multifold. The chief scientific problem appears to be in the background and prior expertise of co-PI's Blackman and Harbour for the professed emphasis on "how decisions may be made that are more transparent and receive the support of the various stakeholder groups" in real cases of sub-surface resource management and tradeoff decisions. Looking through the CV's of these co-PI's, I find considerable evidence of human perfomance measurement and safety analysis but little or no background in the emphasis area, described in quotes above. To be competitive nationally, this proposal needs to include numerically experienced social scientists who can bring the needed breadth in environmental and social decision-making.

I have a few other points that the authors may want to reconsider. The first batch of 6 students will be current workers at INEEL who are "mature scientists and engineers with families" (page C-6). But why? Is it because they can utilize the training best, or because they need a Ph.D., or because the first cohort will not have to go through the perils of job-hunting?

Regarding "a special effort... to recruit qualified Native Americans" from the nearby Shoshore-Bannock reservation, is there a prior record of graduate engineers from this reservation working at INEEL, or is it a pious hope?

The budget presented twice and called "Year 1" and "Cummulative" is really only one budget, the cumulative one. That is fine, but there is not even a parenthetical description of $867,219 requested under sub-awards. Who are these sub-awardees?

I also find it odd that the Director of INEEL is proposed as the chair of the advisory

board. Advice must be preceeded by review, and the chief reviewer must not be the in-house boss, to whom the PI and co-PI's report. Overall I assign the proposal a rating of good.

Reviewer:

Banerjee, Subir K.
Department Geology and Geophysics

Email:banerjee@umn.edu

Suggested Reviewers:

None

Conflict of Interest:

None

Title: Collaborative Research into the Behavior of Fractured Geological Systems and Providing Technical Information to Support Environmental Decisions

Institution: University of Idaho

NSF Program: Integrative Graduate Education and Research Training Program, IGERT-Preproposal

Principal Investigator: Mink, Leland L.

Received Date:09/23/00
Rating: Fair

Review:

Review of NSF-IGERT Preproposal #0092130
"Collaborative Research into the Behavior of Fractured Geological Systems and Providing Technical Information to Support Environmental Decisions"
Leland Mink, et al., University of Idaho

Summary of Proposed IGERT Project:
The proposed project will utilize a select group of faculty from five northwest universities to train 25 doctoral students in an interdisciplinary program focused on research and management of subsurface contaminants and important subsurface natural resources such as petroleum, water and geothermal. The IGERT project would be linked to the relatively new Inland Northwest Research Alliance (INRA) and its multidisciplinary research theme of fluid movement in fractured geological systems. IGERT students would be located at the University of Idaho's Center for Science and Technology in Idaho Falls. Hence, the majority of the program's courses would be delivered to CST by distance modes; i.e., recorded materials and Internet-2. Existing courses at the five participating universities would comprise the educational framework for the IGERT project. Proximity of the CST to the INEEL would be exploited as an important source for the IGERT students.
Review Comments:
This preproposal was apparently prepared with minimal attention to the specific objectives of the IGERT Program. Thus, the preproposal seemingly describes the research basis for the INRA and fails to define an IGERT project focused on graduate education. The minimum descriptions for the proposed graduate program only contain broad statements such as "We propose collecting recognized experts and their students in this common facility with the goal of educating the students through course work and supervised research. " Unfortunately, this reviewer could not find any innovative approaches to graduate education in the preproposal's narrative. The only thing identifiable as "new" in the preproposal is the CST facility.
Although this preproposal was not successful in defining an innovative IGERT project, I would encourage the authors to try again in 2001 provided they are willing to incorporate the specified features of successful IGERT projects in their resubmitted preproposal. My reasons for this encouragement are: 1) the basic topic of research and management of subsurface systems is an excellent one for construction of a

nationally-needed, multidisciplinary graduate program, 2) the combined personnel and infrastructure resources of the five INRA universities, in combination with those from INEEL, could certainly provide a sound foundation for the development of a quite unique graduate program on the theme of improved methodologies for management of subsurface contamination and natural resources, and 3) it should be possible to engage a collection of non-academic stakeholders, external funding sources, and graduate students in such an endeavor because of the growing and inherent importance of these subsurface topics.

Review Summary:

My rating for this preproposal is "Fair" and I therefore place it in category 3 (not recommended).

Reviewer:

Farwell, Sherry O.
Graduate Education and Research Office

Email:sherry.farwell@sdsmt.edu

Suggested Reviewers:

None

Conflict of Interest:

None

Title: Collaborative Research into the Behavior of Fractured Geological Systems and Providing Technical Information to Support Environmental Decisions

Institution: University of Idaho

NSF Program: Integrative Graduate Education and Research Training Program, IGERT-Preproposal

Principal Investigator: Mink, Leland L.

Received Date:09/20/00
Rating: Fair

Review:

Importance and coherence of the multidisciplinary research theme:

The proposed work is to develop a multidisciplinary doctoral training program in subsurface systems management. The goal of the research is to improve prediction of the movement and transformation of subsurface contaminants in fractured geologic media and thereby improve subsequent decision process and actions. This linking of the social and economic decision process with the scientific evaluation process is important and an area in need of additional work. The research approach is model-based, ranging from the physics of water flow to public health. This theme is overly ambitious and unlikely to be successful. However, the actual proposed work is not as broad, but the social science component isn't integrated very well.

Quality of the proposed major research efforts:

The proposed project involves 23 participants from 5 universities and 2 federal labs/research centers. The research will address three focus areas. First, modeling of the subsurface environment will involve equation and model development and laboratory experiments. The second focus area involves decision analysis, risk perception, and social-political impact. The third research area is to characterize the geological subsurface. While individually, each of these focal areas will be useful, there is no indication how they will be integrated with each other and what the final products will be. What seems likely is that there will be three models produced from this work and that the multidisciplinary interaction will be less than desired.

Quality and innovation in the planned graduate education and training:

The training program is limited. The curriculum and training program will consist of existing courses tailored to each individual student, a course in ethics, internships, and co-mentoring. There does not appear to be any new courses that will serve as

the core of this program, but students will be required to take course work in each of the three disciplines. The nature of the student's dissertation committee is unclear. There is an internship program with a national lab that will permit non-traditional (older) students to particpate.

Effectiveness of career development opportunities:

Proposed career development activities are limited and consist mostly of the internships at the INEEL lab cited above and co-mentoring.

Appropriateness of the formal administrative plan and organizational structure:

There is a Program Director and three assistants who will be responsible for managing the grant and an advisory board. Although these individuals have considerable experience in science project management. The plan will include work plans, weekly status meetings, monthly project review report, overall project reviews, and budget and schedule monitoring. Cost sharing consists mostly of existing programmatic support. There does not appear to be any new support specifically targeted for the IGERT program.

Effectiveness of the strategy for preparing a diverse, globally-aware science and engineering workforce:

There will be a special effort to recruit Native Americans and others to the program. It is estimated that about 25 doctoral students will be trained in this program û 13 at U of Idaho and 12 at the other universities.

Appropriateness of the assessment plans:

There will be an advisory board to provide direction to the overall program at regularly scheduled meetings. Beyond this the proposal provides no additional description of an assessment plan.

Reviewer:
Matisoff, Gerald
Department of Geological Science

Email:gxm4@po.cwru.edu

Suggested Reviewers:
None

Conflict of Interest:

None

Title: Collaborative Research into the Behavior of Fractured Geological Systems and Providing Technical Information to Support Environmental Decisions

Institution: University of Idaho

NSF Program: Integrative Graduate Education and Research Training Program, IGERT-Preproposal

Principal Investigator: Mink, Leland L.

Received Date:09/19/00
Rating: Good

Review:

Category 1. The PIs vary from senior / mid / early career scientists with expertise relevant to the proposed activities. They have assembled a good team with a variety of research interests from a number of labs in the NW. The PIs appear to be qualified to conduct this project.

The theme is the behavior of fractured geological systems, and utilization of technical information for social and economic decisions, with an emphasis on environmental cleanup. These are relevant topics of societal interest. Integrating decision making theory with subsurface flow modeling is a novel approach, and could provide a new paradigm for approaching certain sets of environmental cleanup problems.

The major research efforts are: Management of subsurface contaminants. Integrating (1) Engineering-Fluid Dynamics. Improving understanding of the equations used to model flow in geological systems via geological modeling, bench and field scale lab analyses, and computer simulation. (2) Psychology-Decision Analysis. Modeling decisions with uncertain outcomes, risky consequences, and economic/social factors. Develop user interface to support learning and scientific inquiry. (3). Improved parameterization of subsurface for modeling.

These are interesting research topics that pertain directly to the project theme. The inadequacies of Darcy flow for real applications is clear, and there is considerable room for improvement. Unfortunately I am not familiar with the proponents and their research and therefore cannot ascertain to what extent they are qualified to pioneer research in this field. The third research effort (Geology/Hydrology) is a little weak in that its distinction from the first (Engineering-Fluid Dynamics) is unclear. This is not hugely problematic as the proposal stands on the merits of the other two alone.

The education plan is particularly well developed. Required coursework in each of 3 disciplines plus scientific ethics is specified, but details are sparse. Five universities and a government lab will participate in training. This could be a two-edged sword. Exposure to a diverse set of faculty from a variety of institutions could be beneficial to students, but in this particular case I worry that the large geographical distances between host institutions will preclude frequent and close collaboration. I also don't like the idea of taking the first years crop of students from INEEL. Is this primarily a work/study program for INEEL employees? The proposal would be stronger in my view if it entrained a broader set of student trainees.

Administration of the program will be handled by U. of Idaho/ Mink. The operational

plan is well developed and gives confidence that the project would be well managed. The plans for project evaluation are somewhat weak in that all input will come from either internal to the program or a local science advisory board. Evaluation by a geographically diverse outside committee would improve the proposal.
The costs for this proposal come in at $83,888/student trained, which is near the average of proposals I reviewed. I couldn't find reference to the duration of each students support under the project, so its unclear to me if that constitutes their entire tenure as grad students, or a few years, etc. How would the disparity between INEEL employee/students and "regular" students be handled? The INEEL employees will have benefits, salaries, etc, behind them. How about their colleagues who are not INEEL employees? I see potential for some economic/cultural barriers that would degrade the camaraderie of students in the program.
The purchase of $170,000 worth of computer equipment is requested. This is about an order of magnitude greater than other proposals. It is not clear to me, for example, what the difference between a "calculational" and a "decision modeling" computer system is. If massive CPU resources are required, then perhaps a single superfast system could be purchased an accessed remotely by all investigators.

Category 2. û Mention is made of special efforts to recruit local Native Americans into the program, and this is commendable. However, no specific actions or mechanisms for doing so are discussed. As mentioned above, the relationship between education and research in this proposal is not well developed, and therefore it is difficult to know to what extent discovery and understanding will be integrated with teaching, training, and learning.
Subsurface contaminants and environmental cleanup problems are clearly pressing national issues. The PIs capture these big picture issues with their proposal, and the research they propose could contribute significantly to national progress therein.

Overall evaluation. Good. The proposal addresses pressing environmental cleanup issues that deserve attention. Their research proposal is solid and well conceived. I particularly like the marriage of fluid dynamics/engineering with decision making. I would like to see this research go forward. However, the proposal has some significant weaknesses that preclude a higher rating. The graduate education aspects come across as almost an afterthought, and very few details of the graduate experience are provided. I am also concerned about having the program primarily train INEEL employees, which is a fairly narrow way to recruit students.

Reviewer:
Reves-Sohn, Robert A.
Marine Geology and Geophysics

Email:rsohn@whoi.edu

Suggested Reviewers:
None

Conflict of Interest:

None